

Unit 4.5
Counting Principles
Day 3
Combinations

A Combination is the selection of some or all of the elements of a set WITHOUT regard to order. ORDER is NOT important. For example, the combination of Tom and Charlie is the same as the combination of Charlie and Tom.

$$\textcircled{b} P(n, 1) = n$$

$$P(n, 1) = \frac{n!}{(n-1)!} = \frac{n \cdot \cancel{(n-1)!}}{\cancel{(n-1)!}} = n$$

Combinations of n elements taken r at a time

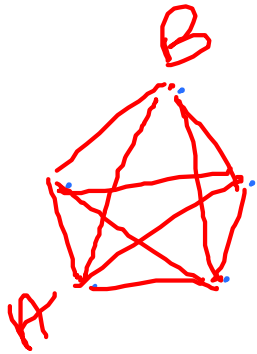
If $\binom{n}{r}$ represents the number of combinations of n elements taken r at a time, with $r \leq n$, then

$${}_nC_r = C(n, r) = \binom{n}{r} = \frac{n!}{(n-r)!r!}$$

1) Fifteen people entered a talent contest. The top 3 contestants will each win \$50, everyone else will get an honorable mention. In how many ways can 3 winners be chosen?

$${}_{15}C_3 = \frac{15!}{12!3!} = \frac{\cancel{15} \cdot \cancel{14} \cdot 13}{3 \cdot 2 \cdot 1} = 455 \text{ ways}$$

2) How many lines are determined by 5 points, no 3 of which are collinear? Remember, 2 points determine a line



$${}^5C_2 = \frac{5!}{2!3!} = \frac{5 \cdot \cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}}{2 \cdot 1} = 10 \text{ lines}$$

3) How many different committees of 4 can be chosen from 12 people?

$${}_{12}C_4 = \frac{12!}{8!4!} = \frac{\overset{5}{\cancel{12}} \cdot \cancel{11} \cdot \cancel{10} \cdot \cancel{9}}{\cancel{4} \cdot \cancel{3} \cdot \cancel{2} \cdot \cancel{1}} = 495$$

possible
committee

4) How many different 5-card hands can be chosen from a 52-card deck?

$$52^C_5 = \frac{52!}{5!47!} = 2,598,960$$

diff card hands

Homework

Unit 4.5

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